Case No.: Loran-003A

ELECTRONIC VEHICLE PRODUCT AND PERSONNEL MONITORING

CROSS-REFERENCE TO RELATED APPLICATIONS

STATEMENT RE: FEDERALLY SPONSORED RESEARCH/DEVELOPMENT

Not Applicable

BACKGROUND OF THE INVENTION

[001] The present invention ~~consists of~~ relates to a system and a method for ~~the~~ tracking, storing, and maintaining ~~of~~ objects ~~and the accordant data as to the location of objects~~ or personnel having RFID tags attached thereto in a defined zone or geographic area such as~~, by way of example,~~ buildings, factories, tractor-trailers, aircraft, railroad cars or other areas where the zones have plurality of points of access or within a defined area. ~~It is a further objective of the~~ The present invention ~~to provide~~ further relates to an improved object or personnel tracking and control system which makes use of a portal RF antenna with infrared optical sensors that can scan the object or personnel RFID tag and~~, with optical sensors, can~~ detect and determine the direction in which objects or personnel are moving. With the use of IR heat sensing and motion sensing sensors, ~~said method and invention can further can determine~~ the presence or absence of an object without an RFID tag~~,~~ and the moving direction of such object as well as whether said moving object is a person or not can be determined.

[002] A number of different methods ~~have~~ has been used in the past to track the location of large numbers of objects (pallets of cargo, packages etc.) or personnel located within buildings, ~~trailors~~ trailers, containers, buses, and aircrafts. These methods have been used for purposes of tracking cargo, employee attendance, school attendance, or logging in passenger manifest along with carry-on luggage. The oldest of this method is by keeping an inventory register of each warehouse or vehicle content and it's delivery records in a paper journal, attendance punch cards, or more recently, with the use of computers or a hand held computerized device and database. The accuracy of inventory or personnel registry depends on each individual operator to properly ~~inputting~~ input information relating to packages or personnel. Such a system is

limited to assessing the number of objects or pallets and cannot accurately identify the location of each and every pallet, package or personnel and entails significant costs from a human resources standpoint.

[003] As one might expect, a variety of different approaches ~~have~~ has been taken ~~to attempt~~ to solve the problem of monitoring large numbers of vehicles, cargo pallets, packages and/or personnel at a specific location (such as a warehouse or office building) or in a vehicle/trailer. From a security perspective, certain applications for purposes of monitoring cargo pallets, packages, luggage, personnel and/or passengers relating to vehicle content, warehouse site, retail stores, schools, at ~~port~~ ports of entry, and airports also require tremendous recourses including security guards, video monitors, magnetic tag detectors, metal detectors, access controls, bar-code readers as well as mechanical or optical counters. While such approaches may reduce the incident of theft, hijacking, personnel attendance, they are not useful in ~~the~~ addressing the primary problem contemplated by the present invention, namely, how to keep track of the location of a plurality of cargo pallets, packages and/or personnel carried in various modes of transportation and/or within a defined geographic area or zone such as warehouses or buildings.

[004] One such system is illustrated in U.S. Pat. No. 4,009,389 to Lindholm. Apparatus for the automatic counting of passengers ~~. Provides an apparatus for detecting~~ that detects the number of passengers entering and/or leaving a collective passenger vehicle~~, by use of~~ projecting a pair of light-beams of invisible light across passenger door way~~,~~ and detecting with the light beam in response to first and second light is disclosed.

[005] Another ~~such~~ example is an automatic counting system for passengers disclosed in U.S. Pat. No. 4,528,679 ~~To~~ issued to Shahbaz et al. ~~Automatic counting system for Passages. For counting~~ The automatic counting system counts the passengers moving into and out of a common carrier vehicle. Three ~~By use of three~~ ultrasonic detectors are used to determine the presence and absence of passengers, while the sequence of detection of passengers at the three different ~~ranging~~ ranges establish a count of number of passengers entering or leaving.

[006] U.S. Pat. No. 5,485,347 issued to Miura~~. Riding~~ discloses a situation Guiding Management System~~. Used~~ used with plural of cars constituting a train, and an up/down counter for counting passengers getting on and off each car with passenger sensor/counter provided at doorways and pass ways of cars. The infrared temperature sensors element are used for sensing

temperature and a pair of photo sensors ~~are serving~~ serves as direction sensor for determining whether a passing passenger is getting on or off a car.

[007] U.S. Pat. No. 5,068,537 issued to Ishikawa et al. ~~Describes~~ describes a passenger ~~Passenger~~ number sensor System wherein a plurality of infrared ray sensors are disposed on a straight line to detect temperature change, a plurality of optical lenses are provided ~~one for each~~ the corresponding one of the plurality of infrared sensors, and a counter is provided to select one of the addition value in a predetermined range according to sense pattern on the temperature change of infrared ray sensors and to add the selected addition value to accumulate count value.

[008] U.S. Pat. No. 5,866,887 issued to Hashimoto et al~~,~~ ~~Describes~~ describes an apparatus for detecting the number of passers. A plurality of ~~row are~~ rows of distance variation measuring sensors is provided on a ceiling ~~of sensors and each have a plurality of distance variation measuring sensors~~. ~~The~~ Each of the distance variation measuring sensors ~~include~~ includes a light emitter and a light receiver in an orthogonal direction to the direction ~~in~~ along which human pass. The number of passers is detected on the basis of the number of the distance variation measuring. The traveling direction of human bodies is detected on the basis of the change in distance.

[009] U.S. Pat. No. 6,255,946 issued to Kim ~~Discloses~~ discloses a ~~System~~ system for detecting the presence and direction of an object passing through a gate.~~,~~ The system ~~using~~ uses a first and a second infrared beams to emit ~~to the~~ reflector, receives a mixed beam ~~in which~~ superimposed by the first and second beams reflected by the reflector ~~are superimposed~~, and determines the presence and direction of the object passing through the gate on the mixed beam

[0010] U.S. Pat. No. 5,661457 issued to Ghaffari et al. ~~Teaches~~ teaches a directional antenna configuration for ~~asset~~ a tracking system~~, for use~~ used in an article tracking.~~,~~ The antenna configuration includes a pair of shorted loops antenna~~,~~ one on ~~each~~ respective side of portal. The antenna configuration also includes a ~~respective~~ second pair of passage antennas ~~are~~ arranged in parallel to the path of travel through the doorway. The antenna configuration permits detection of direction of movement of marked object through a portal.

[0011] U.S. Pat. No. 5,708,423 issued to Ghaffari et al. discloses a ~~Zone-Based asset~~ zone-based tracking and Control System~~,~~ incorporated with a data processing system that maintains records of a plurality of objects. Each object ~~having~~ has a marker. At least four ~~Sensors~~ sensor devices are installed on each side of the ~~at~~ respective doorway~~-two on each side~~. Each marked

object is expected to move ~~moved~~ through the doorway. The sensor ~~devise detects~~ devices detect from the identification signal a direction in which object is being moved. The data processing system receives the detection signal and ~~maintain~~ maintains a data record indicating object present location in the building.

[0012] U.S. Pat. No. 4,009,389 issued to Lindhom, U.S. Pat. No. 5,485,347 issued to Miura, U.S. Pat. No. 5,068,537 issued to Ishikawa et al, U.S. Pat. No. 5,866,887 issued to Hashimoto et al, and U.S. Pat. No. 6,255,946 issued to Kim~~, teachings uses~~ discloses using optical sensors for detection of directional movement, and counting of human at an entry/exit point.

[0013] The teachings in the prior art are not capable of authenticating objects, passers or passengers passing through a particular entry/exit point. U.S. Pat. No. 4,528,679 issued to Shahbaz discloses a similar art using ultrasonic sensors instead of optical sensor. ~~And~~ U.S. Pat. No. 5,661,457 and U.S. Pat. No. 5,708,423 issued to Ghaffari ~~teaches~~ disclose asset tracking by use of multiple portal antennas for reading RFID markers and indicating directional movement of objects or personnel carrying markers. The art found in Ghaffari is useful but not practical in use. In order to fill an average trailer or building entry/exit way with RF field, an antenna loop is being used to cover an entry/exit opening area usually about 8 feet (4 m). Since RFID read antennas radiates a 360 degree RF field, as per Ghaffari teaching, in order to detect marked objects or personnel directional movements, minimum of 2 antennas use is required on one side towards an entry way (one after the other, along the entry way), ~~the~~ these 2 antennas have to be away from each other by at ~~list~~ least 8 feet ~~apart. In order for~~ to allow the RFID antenna reader CPU ~~to be able~~ to detect directional movement of the object or person carrying marker.

[0014] First the reader must determine the actual physical location of a moving object or personnel carrying a marker~~, this is accomplished~~ by determining which one of ~~the to~~ 2 antennas interrogated first and which one interrogated second~~,~~ in order to register a marked object or personnel direction movement detection~~,~~ ~~which is pending~~ depending on physical position of the object or personnel carrying RFID tag at the time of antenna reading. If antennas are less than ~~then~~ 8 feet apart~~,~~ the reader CPU cannot differentiate the tag position because both antennas can read a particular RFID tag at the same time~~. Even,~~ even though ~~as per~~ Ghaffari ~~teaching~~ discloses only one antenna reading ~~has~~ being initiated by the reader CPU at a given time~~,~~ to avoid RF collision. Ghaffari ~~teaching~~ requires a large unusable area in an entry/exit way. One cannot store objects or seat tagged passengers in an entry/exit way (Half of a container, trailer,

passenger car) where such antennas are installed. In order to avoid ~~falls~~ false marker reading, one has to consider unusable valuable space to be wasted for antennas use. Unusable space is a crucial matter, especially in a cargo trailer, passenger car or within small building with partitions.

[0015] It should be noted ~~as per~~ Ghaffari ~~teaching~~ teaches use of 4 antennas in a portal entry/exit ~~as illustrated,~~ for moving marker directional detection. The antennas are operating one at a time interval, one after the other in order to avoid RF collision, thus delaying marker reading speed. Therefore, ~~if~~ an object or personnel carrying the marker ~~passes~~ passing portal antenna zone at fast speed will not be detected, or even if it is detected, the CPU will not be able to differentiate object or personnel carrying marker movement direction. Finally, since Ghaffari ~~teachings rely~~ relies only on an RFID antenna interrogation system to detect movement of marked object, one can pass a marked object behind a antenna panel, a wall patrician, or ~~pass~~ an object or personnel tag on the outer side of a cargo trailer, or a passenger car without physically going through the portal and falsely log an object or a personnel into the system database.

[0016] Although the prior art cited above is useful, none of the inventions include a secure portal scanner for tracking objects and personnel, a portal scanner that can ascertain in a particular location the presence of ~~a~~ particular objects or particular personnel being carried by several modes of transportation such as vehicles, tractor-trailers, or within a defined geographic area such as warehouses and buildings. It is accordingly ~~the primary objective of the present invention~~ a substantial need to provide a secure electronic vehicle, cargo, and personnel tracking information system, which uses a portal scanner for tracking the present location of in a plurality of modes of transportation or at a plurality of physical locations.

~~[0017] It is a related objective of the present invention to enable the monitoring of objects or personnel by use of a secure portal scanner that incorporates a portal panel utilizing a plurality of photo optical sensors as first detectors mounted vertically into said portal panel. A second plurality of photo optical sensors are installed vertically, approx. 2 feet apart from first sensors in said portal panel as a secondary detector, both first and second detectors detection signal is used by said portal reader comparator CPU for indicating directional movement of a mass. At least one or two temperature sensing infrared sensors are also installed in said portal panel, for detecting human presence at said portal point of access, and said portal comparator CPU is used to indicate whether the passing object is that of human or not. An RFID antenna is installed~~

within said portal panel for interrogating the RFID tag affixed to or carried by objects or personnel, and said portal CPU for identifying said tag.

[0018] It is a further objective of the present invention to provide a portal scanner which is capable of reading and identifying said object and personnel carrying tags, as well as indicate the directional movement of said objects and personnel tags, based on first sensor detection and a second sensor detection with or without human temperature presence detection sensing, and for registering an object or human movement towards a direction, along with RFID authentication detection. The present art provides hi speed object or personnel moving directional detection and authentication, which is achieved mainly by use of fast detection response (10 ms) optical sensors for directional movement detection and by use of RFID) tag single antenna reader, with reading speed of 50 ms. Total directional movement and authentication of object or personnel tag is accomplished within 50 to 60 ms. which prevents individuals from being able to remove the objects (i.e., throwing a package out off an cargo trailer) or personnel jump an entry /exit way of a passenger car. The method used in the present art requires the tagged object or personnel to be logged by the portal scanner as it passes by the portal scanner. As per the present art, in order to log an object or a person successfully, the tagged objects or personnel passing through said portal scanner is read by optical detection sensors and the RFID read antenna, so as to register a valid tagged object or personnel direction movement in a database registry.

[0019] In the preferred embodiment of the invention said portal scanner panel is tamper proof by use of built in PIR, microwave or ultrasonic motion detector(s) which covers with an invisible shield the interior of said portal panel to detect any unauthorized opening or tampering of said portal panel, and portal unit location movement sensor are used to avoid any unauthorized moving or tempering of the portal panel. Additionally, the present invention portal scanner unit contains built in RF transmitter or transceiver to transmit all tag read data to a computer interface and or report such tamper event to said computer interface. The portal transceiver used in the present invention communicating with a supervisory data communication with said computer to ascertain the proper operation of said portal reader. The portal scanner communication with the computer interface could be a hard wire connection. The transceiver unit of present portal reader could be a wireless modem having connected to a GPS receiver unit mounted within said portal reader, to report the read tag data along with said portal unit location

~~information to a monitoring station or a web server. The computer interface or a web server in its database contains alphanumeric or photographic information relating to each one of said plurality of tagged object or personnel. When the portal scanner reads a particular tag, an alphanumeric and or photographic information relating to said scanned tag will be downloaded on said site computer monitor, the operator or security personnel will be able to compare and identify the actual scanned object or personnel, with the matching object or personnel alphanumeric or photographic information appeared within said computer monitor or found in the internet server, for verifying the authenticity of said object and person, and for registering said event in its database.~~

~~[0020] To secure the operation of the present portal scanner, a built-in battery back up is implemented with a low battery detection and reporting circuitry. And since the present art requires only one RFID antenna driver circuitry in a point of access (for larger area coverage a slave antenna could be added on opposite side on same reader without sacrificing tag read speed), with plurality of vertically mount optical sensors approx. 2 feet apart on each side of antenna loop, and use of such portal scanner structure takes minimum physical space in a entry or exit way of a trailer, aircraft, railcar, building etc. Thus, use of one antenna reader makes the portal reader more economical and provides more cargo or personnel usable space, which makes the present art more practical for use. And finally the portal scanner could be used in conjunction with or incorporate a metal or explosive detection devise, which makes the system capable of detecting and identifying objects such as a luggage, packages or a pallets, or personnel carrying or containing metal objects or explosives.~~

BRIEF SUMMARY OF THE INVENTION

[0017] To enable monitoring objects or personnel by use of a secure portal scanner, a portal panel into which a first and a second plurality of photo optical sensors are vertically mounted is incorporated. The first detectors serving as first detectors and the second detectors serving second detectors are arranged with approximately 2 feet apart from each other. The detection signals generated by the first and second detectors are used by a portal reader comparator CPU for indicating directional movement of a mass. At least one or two temperature sensing infrared sensors are also installed in the portal panel for detecting human presence at a portal point of access, and a portal comparator CPU is used to indicate whether the passing object is a human

being or not. An RFID antenna is installed within the portal panel for interrogating the RFID tag affixed to or carried by the objects or personnel, and for the portal comparator CPU to identify the tag.

[0018] The portal scanner as discussed above is capable of reading and identifying the object and personnel carrying tags, indicating the directional movement of the objects and personnel tags based on detection of the first and second sensors with or without sensing the human temperature, and for registering an object or human movement along a direction, along with RFID authentication detection. High-speed object or personnel moving directional detection and authentication are achieved mainly by use of fast detection response (10 ms) of optical sensors for directional movement detection and by use of RFID tag single antenna reader with reading speed of 50 ms. Total directional movement and authentication of object or personnel tag are accomplished within 50 to 60 ms, which prevents individuals from being able to remove the objects (i.e., throwing a package out off a cargo trailer) or personnel from jumping through an entry/exit way of a passenger car. The method requires the tagged object or personnel to be logged by the portal scanner as it passes the portal scanner. In order to log on an object or a person successfully, the tagged object or personnel passing through the portal scanner is read by optical detection sensors and the RFID read antenna, so as to register a valid tagged object or personnel direction movement in a database registry.

[0019] In one preferred embodiment, the portal scanner panel is tamper proof by use of built-in PIR, microwave or ultrasonic motion detector(s) covered with an invisible shield inside of the portal panel to prevent from any unauthorized opening or tampering of the portal panel. A portal unit location movement sensor is used to avoid any unauthorized moving or tempering of the portal panel. Additionally, the portal scanner unit contains a built in RF transmitter or transceiver to transmit all tag read data to a computer interface and or report such tamper event to the computer interface. The portal transceiver used in the present invention communicating with a supervisory data communication with the computer to ascertain the proper operation of said portal reader. The portal scanner communication with the computer interface could be a hard wire connection. The transceiver unit of the portal reader could be a wireless modem connected to a GPS receiver unit mounted within the portal reader to report the read tag data and the portal unit location information to a monitoring station or a web server. The computer interface or a web server contains alphanumeric or photographic information relating to each

one of the tagged object or personnel in its database. When the portal scanner reads a particular tag, an alphanumeric and or photographic information relating to the scanned tag will be downloaded to the site computer monitor, such that the operator or security personnel is able to compare and identify the actual scanned object or personnel. When matching object or personnel alphanumeric or photographic information appears on the computer monitor or found in the internet server, the authenticity of the object or person is verified and registered in the database.

[0020] To secure the operation of the portal scanner, a built-in battery backup unit is implemented with a low battery detection and reporting circuitry. Since only one RFID antenna driver circuitry is required in a point of access (for larger area coverage a slave antenna could be added on the opposite side on same reader without sacrificing tag read speed). With multiple vertically mounted optical sensors spaced from each other by approximately 2 feet on each side of an antenna loop and use of the portal scanner structure, the physical space in an entry or exit way of a trailer, aircraft, railcar, building, etc., is minimized. Therefore, use of only one antenna reader makes the portal reader more economical and provides more cargo or personnel usable space, which makes the system more practical for use. In addition, the portal scanner could be used in conjunction with or incorporate a metal or explosive detection device which makes the system capable of detecting and identifying objects such as a luggage, packages or a pallets, or personnel carrying or containing metal objects or explosives.

[0021] ~~The invention is designed to provide Vehicle, Product~~ A vehicle, product and personal tracking and control system is provided to ~~that can~~ record, store, maintain and retrieve a record of a plurality of locations and a plurality of objects or personal having transponders attached thereto and ~~are either~~ carried by various modes of transportation (e.g., vehicle, aircraft, ships, trains) ~~as well as~~ or located within a defined geographic area or physical location (e.g., warehouse, office building) ~~where the defined zones have~~ having a plurality of points of access. ~~It is a further object of the invention to provide an~~ The object or personal tracking and control system ~~which makes use of~~ a portal RF antenna with infrared sensors to identify and detect ~~which identifies and detects~~ a moving direction ~~in which an objects or personals are moved~~ while passing through a portal ~~portals~~.

[0022] ~~According to the invention, the~~ The control system provides and maintains automatically the records of locations of ~~plurality of~~ the objects and personal in real time. The ~~,~~

~~with the~~ system ~~including~~ includes a plurality of object and personal transponder tags mounted on respective objects or personnel moving ~~object or personal for movement with a respective object or personal, each transponder tag utilized~~ for transmitting a unique identification signal respective objects and personnel, a plurality of portal RF antenna with infrared sensors each being ~~is~~ installed at a point of access on a vehicle or at or in a building. With each portal RF antenna with infrared sensor devises, ~~said~~ the RF antenna is operative to receive ~~utilized for receiving~~ the identification signal transmitted from ~~the~~ each object or personal transponder tag as the object and/or person moves through the point of access and the infrared sensors which are used to detect the direction ~~in which~~ the object or personal is moving. Each infrared sensor ~~devise~~ device ~~also generating~~ generates a detection signal indicative of the ~~detected~~ direction of movement of the ~~objects~~ object or personal and ~~the~~ an identification signal of the object or personal in response to the RF antenna reading device ~~devise~~ which receives the identification signal and transmits the identification signal to a ~~Reader~~ reader comparator CPU ~~to~~ for data processing and maintaining ~~said data information~~.

[0023] ~~Another aspect of the invention uses~~ In one embodiment, ~~an~~ a first infrared sensor is used for detecting an object or personal movement, an RF antenna is used to read ~~said~~ the object or personal transponder tag unit and a second infrared sensor is used for detecting an object or personal movement. ~~Said~~ The RF antenna with the infrared sensors is installed at a plurality of points of access. ~~Said points of access~~, at which ~~said~~ the first and second infrared sensors are installed ~~each having associated therewith~~ in a way that a first direction of movement is defined as ~~a~~ the movement into ~~said~~ a detection zone and a second direction of movement is ~~define~~ defined as a movement out of ~~said~~ the detection zone. In the preferred embodiment ~~of the present invention~~ heat detection infrared sensors are used in ~~said~~ the portal scanner device to determine the direction of an object as well as whether ~~said~~ such object is a human or another object carrying an RFID tag. The portal scanner's CPU is also able to process and distinguish ~~said~~ the detection signals and to determine whether the object was a human or another object. The portal scanner can also detect the presence or absence of an object passing the scanner as well as whether said object is a human or another object.

[0024] Additionally, instead of ~~in the present invention, rather than~~ using an RF transponder, a bar-code reader could be utilized to identify objects or personal carrying a bar-code label.

Further, ~~instead of~~ apart from ~~an~~ the IR directional ~~Mass~~ mass movement detectors, ultrasonic ~~Ultrasonic~~ movement detectors could be utilized.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1 ~~Illustrates a Portal~~ illustrates a portal scanner panel with RFID read antenna and read CPU for readings RFID tags; ~~.1.sup.st and 2.sup.nd row of retro-reflective photo optic sensors, for detection of mass movement. A reader Comparator for comparing said detected mass movement, and read tags, and a GPS modem.~~

[0026] FIG. 2 ~~Illustrates same~~ illustrates a portal scanner panel with diffused reflection IR sensors for detection of ~~mass~~ direction movements of a mass;

[0027] FIG. 3 ~~Illustrates a Portal~~ illustrates a portal scanner with dual panel using a master and slave RFID antenna for reading RFID tags; and ~~Through beam IR sensors for detection of mass direction movement~~.

[0028] FIG. 4 ~~Illustrates Portal Scanner Block Diagram~~ is a block diagram of a portal scanner.

DETAILED DESCRIPTION OF THE INVENTION

[0029] ~~Electronic Vehicle, Cargo,~~ A vehicle, cargo, and personnel electronic tracking system is illustrated in FIG. 1 where a ~~Portal~~ portal scanner is used to identify and detect directional movement of a mass such as an~~,~~ container, an object or a person carrying a tag 50, and transmit ~~said~~ information of the detected movement to a computer interface. The ~~Portal~~ portal scanner ~~of the present invention~~ utilizes an improved object and human identification and movement direction detection system. The portal scanner ~~system of the present invention~~ comprises ~~of~~ a pair of portal panels ~~panel~~ 20 between which the objects and/or human to pass through. ~~preferably with~~ The frontal panel material of the portal panels 20 is preferably ~~made of~~ plastic or wood, and side and back panel material ~~made~~ of the portal panels 20 is preferably ferrous metal and aluminum for shielding the RF energy generated by ~~the~~ a portal scanner antenna 22 mounted thereto, so as to prevent radiated antenna energy to travel towards the back and the sides thereof ~~of said portal reader~~. The portal panels ~~panel~~ 20 ~~contains a ray~~ comprise a first set of ~~first~~ retro-reflective IR sensors ~~21, 24, 28 and reflectors 11,~~ installed in ~~said~~ the portal panels

vertically for detecting mass movement. In this embodiment, the first set of retro-reflective IR sensors include three IR sensors 21, 28 and 23 each paired with a reflectors 11 aligned therewith. The portal ~~panel~~ panels 20 ~~is~~ are equipped with a second row of vertically ~~mount~~ arranged detectors 25, 27, 29 and reflectors 12~~, approx, 2 feet~~ spaced apart from ~~said~~ the first row of detectors by a distance of approximately 2 feet~~,~~ for detecting mass movement. A ~~Read~~ read antenna 22 is implemented in the portal scanner mounted on frontal panel 20.~~,~~ The read antenna ~~which~~ is connected to a transponder read CPU 24 installed within ~~said~~ the portal panel 20~~,~~ to interrogate and read a passing RFID tags 50~~,~~ carried by an object or person. The RFID ~~Read~~ read CPU 24, ~~and~~ the first row IR sensors 21, ~~24,~~ 28, 23 and the second row of IR sensors 25, ~~27,~~ 29, 27 ~~is~~ are connected to a reader comparator CPU 26, which is designed to determine the direction flow of an object or personnel~~,~~ ~~bases~~ based on which row of sensors detected a mass movement first and which row of sensors detected said mass movement afterwards~~,~~. ~~and~~ Once the movement direction is determined, the reader comparator CPU 26 is operative to send the collected data from said transponder read CPU 24 along with direction movement data of derived by the ~~said~~ first and second row of sensors detection~~, and send both information data~~ to a computer interface through a hardwire connection 15, or to a GPS/modem/RF transceiver 18, which transmits ~~said~~ the collected data to a computer interface unit, or to a web server.

[0030] In a preferred embodiment ~~of the invention said portal scanner additionally could be equipped with plurality of sensors, in which~~ at least 2 of ~~said sensor~~ the retro-reflective IR sensors 22, 29 could be human body heat detection sensors ~~22, 29~~ and the comparator CPU ~~26 will be~~ is able to differentiate said human body detection signals detected by said sensors 22, 29~~,~~ and mass movement detection sensor signals generated by the retro-reflective sensors 21, 23, 25, 27, and transmit said human presence detection signal along with mass direction movement and identification information to a computer interface through a hard wire or wireless modem.

[0031] In a preferred embodiment, the reader comparator CPU 26 is equipped with a built-in digital counter, which will display the exact amount of objects and or personnel entry/exit count~~.~~ ~~And~~ and displays entry/exit count information of passing object or personnel with or without carrying tag 50 on a separate count listing. The reader comparator CPU 26 ~~in additional~~ is additionally equipped with a buzzer such that ~~Buzzer,~~ when an object or personnel passes through ~~said~~ the portal without carrying a RFID tag 50, the reader comparator CPU26 will beep ~~Beep~~ one time, indicating to the operator an object or personnel pass through without carrying

an RFID tag 50.~~,~~ ~~if~~ If the passing object ~~carrying~~ carries a RFID tag 50, the reader comparator CPU 26 buzzer will beep two times indicating to the operator the passing object or personnel is equipped with the RFID tag 50. The ~~portal scanner~~ reader comparator CPU 26 of the portal scanner operation additionally could be user programmable~~,~~ to give audiovisual event report such as:

[0032] Only RFID tag reading detected by said portal comparator CPU~~.~~ = Audiovisual alarm.

[0033] Constant RFID tag reading for a preset period of time = Audiovisual alarm.

[0034] Detection of an object and or personnel movement without RFID = Audiovisual alarm.

[0035] Constant detection of non moving mass for a preset period of time = Audiovisual alarm.

[0036] Only human movement direction detection by said comparator CPU = Audiovisual alarm.

[0037] The ~~present invention's~~ portal scanner panel 20 as provided is ~~deigned~~ also designed to be ~~of~~ tamper proof ~~design,~~. For example, the portal panel 20 ~~contains~~ comprises an inner motion detector ~~20 an example;~~ such as a PIR, ~~Ultrasonic~~ ultrasonic or microwave motion detector. To prevent unauthorized personnel from opening and tempering ~~of~~ the portal scanner, in addition to the motion sensor 10, optical or pressure sensing tamper switches 37 are installed on the portal back and bottom panel side, facing towards the back or bottom of said portal panel 20, such that action of ~~pressured~~ pressuring or pointing against a back wall, or the floor which said portal is standing on or installed against, and ~~used for the detection of~~ unauthorized removal of a portal scanner can be detected ~~Scanner~~.

[0038] When an object or person carrying a RFID tag 50 passes through said portal scanner, ~~pending~~ depending on object or personnel direction movement, the portal scanner's first or second row of retro-reflective IR sensors detects a movement, and the comparator CPU 26 registers a direction movement~~,~~ based on which ~~one of~~ row ~~(1.sup.st or 2.sup.Nd)~~ sensors ~~sensor~~ detected said movement first. If ~~Temperature~~ a temperature change is detected during the ~~said~~ detection step, then the reader comparator CPU 26 identifies ~~said~~ such detection being obtained from ~~of~~ a human. If the temperature change is not detected during said movement detection, then the comparator CPU 26 registers directional movement ~~of~~ belong to an object passing

~~passed~~ through ~~said~~ the portal 20. At the same time the reader CPU 24 through the read antenna 22 will send an interrogation RF electromagnetic coded signal to ~~said~~ the passing tag 50 which, upon receipt of said interrogating signal, will transmit a signal containing information to ~~said particular tag 50,~~. Upon receipt of the signal from the passing tag 50, the reader CPU 24 ~~upon receiving said interrogation signal from said tag 50,~~ will read and transmit the ~~said~~ tag ~~RFI1)~~ RFID information ~~and pass said~~ information to ~~said~~ the comparator CPU 26. The Comparator CPU 26 transmits both said RFID and mass or human directional movement detection information~~,~~ to an RF transmitter which transmits said information to a computer interface through a wireless modem unit equipped with a GPS receiver unit 18~~,~~. ~~which upon receipt of said signal~~ The GPS receiver unit 18 then transmits ~~said~~ the presence identification signal and the directional movement information of the object or personnel ~~presence identification along with said object or personnel directional movement information,~~ along with the location information of the ~~said~~ portal scanner~~,~~ and the object or personnel ~~location information~~. The location information of the portal scanner ~~location information~~ is important and useful, particularly ~~mainly~~ when ~~said~~ the portal scanner is installed in a mobile environment, such as a passenger car, a cargo trailer, rail car, and aircraft~~,~~ ~~Etc~~ for example.

[0039] When any particular object or personnel information is received by a computer interface, the corresponding ~~related~~ cargo or personnel information will appear ~~into~~ on the monitor of ~~said~~ the computer. If ~~said~~ the monitoring computer is installed in a proximity to the ~~near by said~~ portal scanner ~~reader~~, the operator of ~~said~~ the portal ~~reader~~ scanner can visually verify actual object or person at his or her visual sight ~~site~~, and compare it with alpha numeric and/or photographic information found in the computer database. This will help security personnel to be able to identify the authenticity of a cargo or personnel~~,. Exp.~~ especially at an airport terminal, secure employment area, warehouse distribution center, and retail merchandising. ~~Etc.~~ The computer or server could be installed at a distant location~~;~~ remote from the portal scanner. The detection information will then be transmitted and stored into the ~~said~~ computer/server or into an Internet server. The information downloaded in the sever could be used for just in time management efficiencies, flow of distribution of products, monitoring of personnel attendance, driver/ passenger location and or authentication, etc.

[0040] In a preferred embodiment of the present invention, the portal scanner additionally is equipped with tamper detection sensors 10, 37, to detect unauthorized tampering ~~with~~ against

the inner section of said panel 20 or for unauthorized removal of said panel 20. ~~upon tamper detection; said~~ The tamper detection information will be sent ~~send~~ to a computer monitor, and the computer will alert the operator with an audiovisual warning. The computer interface additionally communicates with said portal scanner unit with a supervisory encryption coded signal~~,~~ to secure proper operation of said portal scanner and to ascertain the proper communication leak between said computer and said portal scanner. The portal scanner of the present invention operates with AC power adapter or vehicle power supply, ~~as an additional alternative power supply~~ or alternatively, the portal scanner ~~of the present invention~~ has a built-in rechargeable battery. If external power supply is being cut, the portal scanner comparator CPU 26 will transmit a unique coded signal~~,~~ to indicate that portal unit is operating on back up battery power.

[0041] FIG. 2 illustrates a similar method for the use of the art, without use of reflectors 11 and 12. In this embodiment, the retro-reflective IR sensors are replaced ~~Which is achieved~~ by ~~use~~ diffused-reflection sensors 21, 24, 28, 25, 27, 29.

[0042] FIG. 3 shows 2 portal panels facing each other, including a master panel 40 and a slave panel 30. The master panel 40 ~~contains~~ comprises a read antenna 42~~,~~ connected to an RFID read CPU 46.~~,~~ ~~using through beam~~ The use of optical beam detection method of mass movement ~~detection method, which~~ is immune from simulated reflector sensor tampering. ~~Said~~ A first row of sensors optical collectors 45, 47, 49 are mounted vertically on frontal panel of ~~said~~ the master portal 40, and a second row of sensors optical collectors 41, 43, 48 are mounted ~~approx.~~ about 2 feet apart from ~~said~~ the first row of vertically ~~mount~~ mounted sensors collectors 45, 47, 49. ~~Which~~ The sensor collectors 45, 47 and 49 are ~~is~~ connected to a comparator CPU 44. The slave panel ~~contains~~ comprises a slave antenna 32 connected to ~~said~~ the reader CPU 46, ~~and~~ a row of vertically ~~mount~~ mounted optical sensor emitters 31, 33, 35~~,~~ serving as first emitters,~~. And~~ and a second row of emitters 34, 38, 36 mounted vertically on the slave panel 30 ~~approx.~~ about 2 feet apart from ~~said~~ the first row of emitters 31, 33 and 35. ~~Use~~ The use of ~~2~~ a pair of antennas facing each other and sharing the ~~shared by~~ same reader circuitry provides better RFID tag reading in a larger entry/exit area, since ~~through beam sensor does not use~~ reflectors are not required or used for such through beam detection. Thus the use of through beam sensors eliminates the possibility of ~~one~~ using a reflector to avoid the detector detecting mass directional movements.

WHAT IS CLAIMED IS:

~~1. A method for detecting and tracking a plurality of moving tagged objects or personnel, and for authenticating said plurality of tagged objects or personnel and transmitting said detected tagged object and or personnel information. Detecting means the detection of a plurality of objects' movement by the use of sensors. Tagged object or personnel means a plurality of objects and/or persons carrying a tag with a unique identification code authentication means for a reader/comparator the identification of said objects or persons carrying uniquely coded tags, by communicating with an interrogation signal(s) with said tags, and comparing said sensor movement detection signal and a transmitting means to transmit said sensor detection and or said tag read identification information.~~

~~2. A method defined in claim 1 wherein said tagged objects or personnel movement detection and authentication system, comprising of:~~

~~A tag with a unique code carried on an object(s) or person(s) used for identification of said object(s) or person(s).~~

~~A scanner panel equipped with at least a pair of optical human body heat and or motion-sensing detectors installed on said scanner panel apart from each other to transmit and receive optical and or ultrasonic beams through a predetermined area. Said object or personnel movement through said beams, interrupts said transmitting and receiving beam signal(s).~~

~~A reader is incorporated within said scanner panel, for interrogating and identifying said detected objects or personnel uniquely coded tags. Said reader upon interrogating said tag, transmitting said interrogated tag identification.~~

~~A comparator CPU for receiving said first and second sensor interruption detection signal, and for receiving said reader interrogated tag information, and for determining said passing tagged objects or personnel directional movement, and to transmit said identification information relating to said object and or personnel, with said object or personnel direction movement information, to a computer interface.~~

~~3. A method defined in claim 2 wherein said tag is an RFID and or a bar-code tag and said reader is an RFID reader equipped with an antenna and or a bar-code reader.~~

4. A method defined in claim 2 wherein said comparator CPU upon receiving said sensor detection signal, said comparator CPU signaling said reader to transmit and interrogation signal(s) to read said tag(s).

5. A method defined in claim 2 wherein said comparator CPU upon receiving said sensor detection signal, said comparator CPU signaling said reader to transmit and interrogation signal(s) to read said tag(s).

6. A method defined in claim 2 wherein said comparator CPU utilizes an electronic counter, indicating total number of objects and or personnel passing through said reader/scanner, said reader/comparator electronic counter tally indicating separately the total number of passing objects or personnel with or without identification tag.

7. A method defined in claim 2 wherein said comparator CPU additionally is connected to a buzzer and or a speaker, said comparator CPU upon detecting movement of objects and or personnel, located in front or passing through said reader scanner, said Buzzer and or speaker produce's verbal or audible signals.

8. A method defined in claim 7 wherein said comparator CPU upon detecting movement of objects or personnel without receiving tag read data, said comparator CPU producing verbal or audible alarm signal(s) through said buzzer or speaker, and or transmitting said alarm condition information to a computer interface.

9. A method defined in claim 7 wherein said comparator CPU receiving tag read signal without object or personnel movement detection signals, said comparator CPU initiating a verbal and or audible alarm signal through said buzzer or speaker, and or transmitting said alarm condition information to a computer interface.

10. A method defined in claim 7 wherein said comparator CPU upon detecting movement of object or personnel without receiving read tag RFID signal, said buzzer or speaker producing a verbal or audible signal. If said movement detection contains read signal, said comparator CPU buzzer or speaker produces a second verbal or audible signal.

11. A method defined in claim 2 wherein said reader/comparator is connected to an RF transmitter, or a transceiver Modem) to transmit said object detection movement and or read tag data information to a computer interface unit.

12. Method defined in claim 2 wherein said reader/comparator is connected to a computer through a hard wire connection.

~~13. Method Defined in claim 11 wherein said RF transceiver or modem is connected to a GPS receiver unit, said transceiver or modem unit is transmitting said object or personnel movement detection and or said tag read information along with said reader/scanner location information to a computer interface or Web server.~~

~~14. Method defined in claim 2 wherein said computer interface or web server containing alphanumeric or photographic information relating to said tagged objects or personnel. Said computer interface upon receiving particular read tag information, displaying said alphanumeric or photographic information relating to said particular read object or personnel into said computer monitor.~~

~~15. Method defined in claim 14 wherein said computer interface or web server is programmed with, each one of plurality of personnel ID tags with plurality of matching object tags. Said computer interface upon receiving a particular personnel tag and personnel carrying tagged object scanned information, said received personnel and object tag's information is compared within said computer data base. If said particular personnel and particular object tag(s) is not of a match to said computer data base information. Said computer interface signaling the operator of said computer with an audio and or visual alarm signal.~~

~~16. Method defined in claim 2 wherein said reader/comparator and the computer interface unit is communicating at time interval with a supervisory data communication to ascertain proper operation of said reader/scanner.~~

~~17. Method defined in claim 2 wherein said reader/scanner panel, is equipped with built in motion sensors, to detect intrusion or tempering within said panel. Said motion sensor transmits intrusion detection signal to a built in buzzer or to a computer interface. Said intrusion signal is transmitted to said computer interface by means of a hard wire connection, or by a built in RF transmitter/transceiver and or a GPS/modem~~

~~18. Method defined in claim 17 wherein said panel motion detectors are infrared, ultrasonic, or microwave detectors protecting the interior of said panel with an invisible shield.~~

~~19. Method defined in claim 17 wherein said panel sensors additionally is equipped with sensors mounted on the back and the bottom of said panel, for detection of unauthorized removal or relocation of said panel.~~

~~20. Method defined in claim 2 wherein said scanner panel is powered by a battery.~~

~~21. Method defined in claim 2 wherein said scanner panel is powered by an external power supply, said scanner panel additionally is equipped with a built in battery back up circuitry. Disconnect of said external power supply causes said reader/scanner to transmit a unique coded signal to a computer interface unit and or sound the built in buzzer.~~

~~22. Method defined in claim 2 wherein said reader/scanner is additionally equipped with a metal detector circuitry.~~

~~23. Method defined in claim 2 wherein said reader/scanner panel additionally is equipped with an explosive detection circuitry.~~

24. ~~Method defined in claim 2 wherein said reader/scanner is a portal scanner. Said portal scanner is installed in a fix position and or used in mobile applications.~~

25. A method for detecting and tracking a plurality of objects passing through or located in a predetermined portal area, comprising:

detecting presence of the objects at a first position within the portal area;

detecting presence of the objects at a second position within the portal area;

identifying the objects by interrogating with tags attached to or carried by the objects; and

determining direction of movement of the objects according to detection sequence between the first and second positions.

26. The method of Claim 25, further comprising a step of determining whether the objects are human beings or not by sensing temperature of the objects.

27. A system for identifying and tracking an object passing through or located at a portal area, comprising:

a tag carried by or attached to the object, the tag being encoded with unique identification information;

a portal panel unit located at the portal area;

a first set of detectors mounted on the portal panel unit to detect the object; and

a second set of detectors mounted on the portal panel unit to detect the object, the second set of detectors being spaced from the first set of detectors by a predetermined distance.

28. The system of Claim 27, wherein the tag includes a radio-frequency identification (RFID) tag or a barcode tag.

29. The system of Claim 27, wherein each of the first and second sets of detectors includes a plurality of vertically arranged detectors operative to detect presence of the objects.

30. The system of Claim 29, wherein each of the vertically arranged detectors includes a diffused-reflection sensor.

31. The system of Claim 29, wherein each of the vertically arranged detectors includes an IR sensor and a reflector aligned with each other across the portal area.

32. The system of Claim 29, wherein each of the vertically arranged detectors includes an optical emitter and an optical collector aligned with each other across the portal area.

33. The system of Claim 27, wherein each of the first and second sets of detector further comprises a human body heat sensor to detect whether the object is a human being or not.

34. The system of Claim 27, further comprising a comparator operative to compare detection sequence of the first and second set of detectors, so as to determine movement direction of the object.

35. The system of Claim 34, further comprising a reader operative to receive detection information generated by the first and second sets of detectors and the RF antenna and to transmit the detection information to the comparator.

36. The system of Claim 27, further comprising a programmable warning device to generate a signal when:

a) no tag information of the object being detected is available;

b) no object information of the identified tag is available;

c) no movement of the object is detected;

d) only human movement is detected; or

d) any combination of the conditions of (a) to (d).

37. The system of Claim 27, further comprising a built-in motion detector or a built-in pressure sensing temper switch.

38. A portal scanner, comprising:

a first set of detectors operative to detect presence of an object at a first position within a portal area; and

an RF antenna operative to interrogate a tag encoded with an identification code located within the portal area, wherein the tag is carried by or attached to the object.

39. The portal scanner of Claim 38, the first set of detectors includes a plurality of vertically arranged detectors.

40. The portal scanner of Claim 39, wherein each of the vertically arranged detectors includes a diffused-reflection IR sensor, a pair of IR sensor and reflector aligned with other across the first position, or a pair of an optical emitter and collector aligned with other across the first position.

41. The portal scanner of Claim 38, further comprising a built-in motion sensor or a pressure sensing tamper switch for detecting movement of the portal scanner.

42. The portal scanner of Claim 38, further comprising a comparator operative to count numbers of objects and tags being detected.

43. The system of Claim 38, further comprising a second set of detectors spaced from the first set of detectors by a predetermined distance.

44. The system of Claim 43, wherein the predetermined distance is about 2 feet.

45. The system of Claim 43, further comprising a comparator operative to determine direction of movement of the object according to detection sequence of the object by the first and second sets of detectors.

46. The system of Claim 43, wherein each of the first and second set of detectors includes an IR body heat sensor operative to detect whether the object is a human being or not.

47. The system of Claim 43, wherein the first and second detectors each includes a plurality of vertically arranged IR detectors.

48. The portal scanner of Claim 47, wherein each of the vertically arranged detectors includes a diffused-reflection IR sensor, a pair of IR sensor and reflector aligned with other across the second position, or a pair of an optical emitter and collector aligned with other across the second position.

49. The portal scanner of Claim 38, further comprising a metal detector circuitry for detecting present of metal within the portal area.

50. The portal scanner of Claim 38, further comprising an explosive detection circuitry for detecting presence of explosive material present within the portal area.

ABSTRACT OF THE INVENTION

[0043] A system for ~~Object or personnel~~ detecting presence, identifying, and detecting directional movement of an object or personnel is ~~detection, identification and~~ directional movement ~~scanner system~~ installed at points of access for vehicle, object, or personnel tracking. The system ~~comprises of~~ has at least a pair of IR heat and/or motion-sensing detectors installed on a scanner panel with a space approximately 2 feet apart from each other~~,~~ for ~~purposes of~~ transmitting and receiving optical beams across ~~said~~ the point of access. An RFID reader with an antenna is incorporated within ~~said~~ the scanner panel. When an object passes through ~~said~~ the point of access, ~~said~~ the panel scanner is capable of detecting which direction ~~said~~ the object traveled. The scanner panel also has the ability to distinguish whether the object is a human or ~~as compared to~~ an object. This functionality is dependent on the triggering of heat and or motion sensors/detectors, which can authenticate ~~said~~ the objects and/or personnel carrying an RFID tag ~~as well as~~ and information of the RFID tag ~~transmitting said data~~ to a computer interface.